REMARKS

Please reconsider this application in view of the above amendments and the following remarks. Applicants thank the Examiner for carefully considering this application and for indicating that the drawings filed on July 27, 2007 are accepted.

Amendments to the Specification

The specification is amended herein to remove the reference to electromagnetic signals.

Disposition of Claims

Claims 1-47 are pending. Claims 1, 2, 18, 27, 33, 37, 42, 46, and 47 are independent. The remaining claims depend directly or indirectly from the independent claims.

Claim Amendments

Claims 18, 33, 42, and 47 are amended for clarification. Claim 10 is amended to correct antecedent basis. No new matter is added by these amendments as support may be found, for example, in Figure 28 and pages 42-43 of the specification.

Rejections under 35 U.S.C. § 101

Claims 27-47 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter for allegedly being directed to software embodied as electromagnetic signals. In making this rejection, the Examiner specifically cites to lines 17-19 on page 51 of the specification as disclosing the computer-readable medium may be electromagnetic signals. *See* Office Action dated November 5, 2007 at page 2. The specification is amended herein to remove these lines. Accordingly, claims

27-47 are in compliance with 35 U.S.C. § 101 and are therefore allowable. Withdrawal of this rejection is requested.

Rejections under 35 U.S.C. § 112

Claim 10 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Examiner states that the limitation "in the imitator" has insufficient antecedent basis. Claim 10 is amended herein to replace "imitator" with "mutator" as suggested by the Examiner. Accordingly, withdrawal of this rejection is requested.

Rejections under 35 U.S.C. § 102

Claims 1-10, 12-23, and 25-47 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication 2007/0185943 A1 ("Bacon"). This rejection is traversed.

"A claim is anticipated only if *each and every element* as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP § 2131 (emphasis added). Further, "[t]he identical invention must be shown in as complete detail as is contained in the claim." *Id.* Applicants assert that Bacon fails to disclose all the limitations of the claims.

Independent claim 1 recites, in part,

> deferring emission of write-barrier code corresponding to at least one reference-modifying instruction in the mutator by recording in a list a separate entry for each reference-modifying instruction whose write barrier emission has been deferred, wherein each list entry stores at least enough information to enable a write barrier to be generated for the entry's corresponding reference-modifying instruction …
>
> emitting, at a predetermined point in the mutator, at least one deferred write barrier corresponding to a list entry.

Claim 1 clearly requires that the *emission* of write-barrier code corresponding to reference-modifying instructions is *deferred* by recording an entry in a list for each such instruction for which write-barrier emission is deferred. Further, claim 1 clearly requires that each list entry stores information to enable a write barrier to be *generated* for the corresponding instruciton. Finally, claim 1 clearly requires that at least one of the deferred write-barriers is emitted at a predetermined point in the mutator. In other words, claim 1 requires deferring the emission of write-barrier code and emitting deferred write-barrier code at some predetermined point in the mutator.

The Examiner appears to rely on paragraph [0044] of Bacon to disclose the deferral of the emission of write-barrier code and the emission of the deferred write-barrier code in a mutator. *See* Office Action dated November 5, 2007 at pages 5-6. The cited portion of Bacon states that during mutator operation "[o]nly heap updates are reference-counted, and those operations are deferred *with* a write barrier by storing the addresses of objects whose counts must be adjusted into mutation buffers, which contain increments or decrements." Bacon at [0044] (emphasis added). This paragraph of Bacon says absolutely nothing about deferring the emission of write-barrier code or emitting deferred write-barrier code. Instead, it merely discloses that reference counting operations on heap updates are deferred *during mutator operation* using write barrier code that stores the addresses of objects whose counts must be adjusted. Clearly, the referenced write barrier code has already been emitted and is present in the mutator. Further, this is the only mention of a write-barrier in Bacon. Accordingly, Bacon cannot possibly be read to disclose deferring emission of write-barriers and emitting deferred write barriers at a predetermined point in a mutator as required by claim 1 without mischaracterizing the teachings of Bacon, which is improper.

In view of the above, independent claim 1 is not anticipated by Bacon. Independent claims 2, 27, 37, and 46 include limitations similar to those discussed above for claim 1 and are thus not anticipated by Bacon for at least the same reasons. Claims 3-17, 28-32, and 38-41 depend from claims 2, 27, and 37 and are thus not anticipated by Bacon for at least the same reasons. Accordingly, withdrawal of this rejection is requested.

Amended claim 18 recites, in part,

> suspending execution of the mutator at a possible safe point in the mutator;
>
> locating, while the mutator is suspended, a list containing a separate entry for each reference-modifying instruction in the mutator that was executed without corresponding write-barrier code before the mutator was suspended, each list entry containing enough information to inform the garbage collector of the same information that the garbage collector would have received if a write barrier had been executed for the entry's corresponding reference-modifying instruction.

Claim 18 clearly requires suspending a mutator and then, while the mutator is suspended, locating a list that includes an entry for each reference-modifying instruction in a mutator that is executed without executing the corresponding write-barrier code before the mutator was suspended.

The Examiner erroneously alleges that paragraphs [0065]-[0066] of Bacon disclose the above limitations. *See* Office Action dated November 5, 2007 at page 11. The cited paragraphs are part of a discussion related to concurrent garbage collection of cyclic data structures in a reference counting garbage collection algorithm. *See* Bacon at paragraph [0054]. The paragraphs particularly relied on by the Examiner merely discuss how the described approach to concurrent collection of cyclic data structures ensures that "in the event of *concurrent mutator activity*, the information about the true reference count of the objects is never lost." Bacon at [0065] (emphasis added). More specifically, these paragraphs refer to the mutator operating concurrently with the garbage collector and both affecting a list of nodes in an object graph. See Bacon at paragraphs [0065]-[0066]. In contrast, claim 18 specifically requires suspending the execution of the mutator, and then, while the mutator is suspended, locating a list containing entries corresponding to reference-modifying instructions for which corresponding write-barrier code was not executed prior to the suspension of the mutator.

Furthermore, as mentioned above in reference to claim 1, the only mention of a write-barrier in Bacon is in paragraph [0044], which discloses *executing* write-barrier code in a mutator to defer reference counting of stack updates. Accordingly, Bacon cannot be read to disclose a list that includes an entry for each reference-modifying instruction in a mutator that is executed *without executing* the corresponding write-barrier code as required by claim 18 without completely mischaracterizing the teachings of Bacon.

In view of the above, independent claim 18 is not anticipated by Bacon. Independent claims 33, 42, and 47 include limitations similar to those discussed above for claim 18 and are thus not anticipated by Bacon for at least the same reasons. Claims 19-26, 34-36, and 43-45 depend from claims 18, 33, and 42 and are thus not anticipated by Bacon for at least the same reasons. Accordingly, withdrawal of this rejection is requested.

Rejections under 35 U.S.C. § 103

Claims 11 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bacon in view of U.S. Patent Publication 2003/0154468 A1 ("Gordon"). This rejection is traversed.

As stated above, Bacon does not teach all the limitations of claims 2 and 18. Further, Gordon does not provide what Bacon lacks as is evidenced by the fact that the Examiner relies on Gordon to disclose deferral from a first basic block to a second basic block in an extended basic block and generation by a compiler at compile time. *See* Office Action dated November 5, 2007 at pages 14-15. Therefore, the combination of Bacon and Gordon does not render claims 2 and 18 obvious. Claims 11 and 24 depend from claims 2 and 18, respectively, and are thus not rendered obvious by Bacon and Gordon for at least the same reasons. Accordingly, withdrawal of this rejection is requested.

Conclusion

Applicants believe this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 33226/971001).

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